

IN THE CLAIMS:

This listing of claims replaces all prior versions of the claims in the application. Please cancel claims 1-27 of the application without prejudice to or disclaimer of the subject matter therein. Please add new claims 28-61.

Listing of claims:

Claims 1-27 (canceled).

28. An apparatus, comprising:

a housing;

a sphere positioned in the housing, the sphere being rotatable in at least one rotary degree of freedom;

a sensor coupled to the housing and configured to output sensor signals associated with a movement of the sphere in the at least one rotary degree of freedom; and

an actuator coupled to the housing and configured to output haptic feedback approximately along an axis that is substantially normal to a point of the sphere extending from the housing, the haptic feedback being based on the sensor signals.

29. (New) The apparatus of claim 28, further comprising an inertial mass coupled to the actuator, the actuator and the inertial mass collectively configured to output the haptic feedback, the haptic feedback being an inertial haptic feedback.

30. (New) The apparatus of claim 28, wherein the haptic feedback is associated with a graphical representation displayed by a graphical user interface, a position of the sphere in the at least one rotary degree of freedom being associated with data values of a position of a cursor displayed in the graphical user interface.

31. (New) The apparatus of claim 28, wherein the haptic feedback is associated with a simulated interaction of a cursor and a simulated graphical object in a graphical user interface.

32. (New) The apparatus of claim 28, wherein the haptic feedback is associated with data values associated with movement of a cursor between menu items in a displayed graphical menu.

33. (New) The apparatus of claim 28, wherein the haptic feedback includes a force sensation, the force sensation being at least one of a pulse, a vibration, and a texture.

34. (New) The apparatus of claim 28, wherein the haptic feedback is a vibrotactile haptic feedback that is provided by a moving element.

35. (New) The apparatus of claim 34, wherein the moving element is a cover portion of the housing, the cover portion being movably coupled to a remaining portion of the housing.

36. (New) The apparatus of claim 34, wherein the moving element is a button, the button being configured to provide input to a host computer.

37. (New) The apparatus of claim 28, further comprising a microprocessor coupled to the sensor and the actuator, the microprocessor being configured to send haptic feedback signals to the actuator based on host commands received from a host computer, the microprocessor further configured to send locative data to the host computer, the locative data being associated with the sensor signals and the movement of the sphere.

38. (New) The apparatus of claim 28, wherein the actuator is configured to output the haptic feedback, the haptic feedback being associated with a command received from a host computer.

39. (New) An apparatus, comprising:

a housing;

a sphere positioned in the housing, the sphere being rotatable in at least one rotary degree of freedom;

a sensor coupled to the housing and configured to output sensor signals associated with a movement of the sphere in the at least one rotary degree of freedom; and

an actuator coupled to the housing, the actuator being configured to output haptic feedback; and

at least one compliant element coupled to the housing, the at least one compliant element being configured to amplify the haptic feedback.

40. (New) The apparatus of claim 39, wherein the at least one compliant element includes a compliant coupling between the housing and a support for the housing.

41. (New) The apparatus of claim 39, wherein at least a portion of the sphere extends from the housing, the haptic feedback being output approximately along an axis substantially normal to a point of the sphere.

42. (New) The apparatus of claim 39, wherein the haptic feedback is associated with a simulated interaction of a cursor with a simulated graphical object displayed in a graphical environment.

43. (New) The apparatus of claim 39, further comprising an inertial mass coupled to the actuator, the actuator and the inertial mass collectively configured to output the haptic feedback, the haptic feedback being an inertial haptic feedback.

44. (New) The apparatus of claim 43, further comprising a flexure member, the flexure member being configured to provide a centering spring force to the inertial mass.

45. (New) The apparatus of claim 39, wherein the haptic feedback is a vibrotactile force, the actuator being configured to drive a moving element.

46. (New) The apparatus of claim 39, further comprising a microprocessor coupled to the sensor and the actuator, the microprocessor being configured to output haptic feedback signals to

the actuator based on host commands received from a host computer, the microprocessor further being configured to send locative data to the host computer, the locative data being associated with the sensor signals and the movement of the sphere.

47. (New) The apparatus of claim 39, the actuator being a first actuator, the apparatus further comprising a second actuator configured to output a second haptic feedback in the at least one rotary degree of freedom.

48. (New) The apparatus of claim 47, wherein said second actuator is a passive brake configured to provide a resistance to rotation of the sphere.

49. (New) A method, comprising:

sending a first signal associated with a movement of a sphere of a haptic feedback device to a host computer, the sphere having an extended portion;

receiving a second signal from the host computer, the second signal being associated with a simulated interaction or event occurring within a graphical environment; and

outputting haptic feedback based on the second signal, the haptic feedback being output approximately along an axis substantially normal to a point of the extended portion of the sphere.

50. (New) The method of claim 49, wherein the haptic feedback is output in response to a movement of an inertial mass coupled to an actuator.

51. (New) An apparatus, comprising:

a sphere;

a sensor configured to output sensor signals associated with a movement of the sphere in the rotary degree of freedom; and

an actuator configured to output haptic feedback approximately along an axis that is substantially linear to an extended portion of the sphere, the haptic feedback being based on the sensor signals.

52. (New) The apparatus of claim 51, further comprising an inertial mass coupled to the actuator, the actuator and the inertial mass collectively configured to output the haptic feedback, the haptic feedback being an inertial haptic feedback.

53. (New) The apparatus of claim 51, wherein the haptic feedback is associated with a graphical representation displayed by a graphical user interface, a position of the sphere in the at least one rotary degree of freedom being associated with data values of a position of a cursor displayed in the graphical user interface.

54. (New) The apparatus of claim 51, wherein the haptic feedback is associated with a simulated interaction of a cursor and a simulated graphical object in a graphical user interface.

55. (New) The apparatus of claim 51, wherein the haptic feedback is associated with data values associated with movement of a cursor between menu items in a displayed graphical menu.

56. (New) The apparatus of claim 51, wherein the haptic feedback includes a force sensation, the force sensation being at least one of a pulse, a vibration, and a texture.

57. (New) The apparatus of claim 51, wherein the haptic feedback is a vibrotactile haptic feedback that is provided by a moving element.

58. (New) The apparatus of claim 57, wherein the moving element is a cover portion of the housing, the cover portion being movably coupled to a remaining portion of the housing.

59. (New) The apparatus of claim 57, wherein the moving element is a button, the button being configured to provide input to a host computer.

60. (New) The apparatus of claim 51, further comprising a microprocessor coupled to the sensor and the actuator, the microprocessor being configured to send haptic feedback signals to the actuator based on host commands received from a host computer, the microprocessor further

configured to send locative data to the host computer, the locative data being associated with the sensor signals and the movement of the sphere.

61. (New) The apparatus of claim 51, wherein the actuator is configured to output the haptic feedback, the haptic feedback being associated with a command received from a host computer.